Claims

What is claimed is:

1. A method for controlling a roller shade having a rotatably supported roller tube windingly receiving a flexible shade fabric, the method comprising:

rotating the roller tube to move a lower end of the shade fabric between first and second shade positions; and

varying the rotational speed at which the roller tube is rotated during the movement of the shade fabric.

2. The method according to claim 1 further comprising:

providing a motor having a rotatably driven output shaft operably connected to the roller tube for rotating the roller tube; and

controlling the motor to vary the rotational speed of the output shaft during the movement of the shade.

3. The method according to claim 1, further comprising moving the lower end of the shade fabric upwardly or downwardly with respect to the roller tube depending on the direction of rotation for the roller tube, and varying the rotational speed at which the roller tube is rotated by increasing the rotational speed during downward movement of the shade fabric lower end and by decreasing the rotational speed during upward movement of the shade fabric lower end.

4. The method according to claim 2 further comprising:

directing a pulse width modulated duty cycle signal to the motor to establish a particular rotational speed for the output shaft of the motor; and

modifying the pulse width of the pulse width duty cycle signal to vary the rotational speed of the motor output shaft.

5. The method according to claim 4 further comprising:

providing a controller adapted to generate the pulse width modulated duty cycle signal and an H-bridge circuit between the controller and the motor.

6. The method according to claim 1, wherein the rotational speed of the roller tube is varied such that linear shade speed is substantially constant.

7. A method for controlling a roller shade having a rotatably supported roller tube, the roller tube windingly receiving a flexible shade fabric, the method comprising:

providing a drive system including a motor operably engaging the roller tube to rotate the roller tube, the drive system adapted to vary the rotational speed at which the roller tube is rotated;

directing the drive system to rotate the roller shade to move a lower end of the shade fabric with respect to the roller tube;

determining the position of the lower end of the shade fabric; and

directing the drive system to vary the rotational speed at which the roller tube is rotated depending on the position of the lower end of the shade fabric.

8. The method according to claim 7 wherein the motor of the drive system includes a rotatingly driven shaft, the method further comprising:

providing a Hall effect sensor assembly located adjacent the motor output shaft to generate a Hall effect signal during rotation of the motor output shaft for determining revolutions of the shaft;

providing a microprocessor adapted to receive the Hall effect signal from the sensor assembly and to maintain a counter number that is increased or decreased depending on the direction of rotation of the motor output shaft;

assigning a default counter number associated with a default shade position for the shade fabric;

determining the difference between a current counter number associated with a current shade position and the default counter number;

determining the number of revolutions of the roller tube between the given shade position and the default shade position that is equivalent to the counter number difference; and

determining the current shade position based on the equivalent number of roller tube revolutions.

9. The method according to claim 8, wherein the default shade position is the fully-closed shade position.

10. The method according to claim 9, wherein the shade fabric is moveable between the fully-opened shade position and a fully-closed shade position, and wherein the counter number associated with the fully-opened shade position is sufficiently large to provide for a positive counter number regardless of whether the counter number is increased or decreased during movement of the shade fabric between the fully-opened and fully-closed shade positions.

11. The method according to claim 7 wherein the shade fabric has a thickness and is movable between a fully-opened shade position in which a length of the shade fabric is windingly received by the roller tube and fully-closed shade position, the method further comprising:

selecting a desired linear speed for the shade fabric;

determining a base rotational speed for moving the shade fabric at the desired linear speed at the fully-closed shade position;

determining the number of roller tube revolutions necessary to move the shade fabric between the fully-closed and fully-opened shade positions based on the length and thickness of the shade fabric;

determining a fully-wound radius that is equal to the distance between a rotational axis for the roller tube and the point at which the shade fabric is windingly received at the fully-opened shade position; and

determining a rotational speed reduction with respect to the base rotational speed that is necessary at the fully-opened shade position to move the shade fabric at the desired linear speed.

12. The method according to claim 11 further comprising:

determining a scaled rotational speed reduction with respect to the base rotational speed based on the position of the shade fabric; and

directing the drive system to adjust the rotational speed at which the roller tube is rotated based on the scaled rotational speed reduction.

13. The method according to claim 7, wherein the rotational speed of the roller tube is varied such that the linear speed at which the lower end of the shade fabric is moved is substantially constant.

14. A roller shade system comprising:

first and second roller shades, each including a rotatably supported roller tube and a flexible shade fabric windingly received by the roller tube, each roller shade further including a drive system operably engaging the associated roller tube for drivingly rotating the roller tube for movement of a lower end of the associated shade fabric between a fully-opened shade position

and a fully-closed shade position, each of the drive systems adapted to vary the rotational speed at which the associated roller tube is rotated,

the second roller tube having an outer diameter that is larger than an outer diameter of the first roller tube; and

at least one controller for directing the first and second drive systems to rotate the first and second roller tubes, the controller adapted to direct the first drive system to rotate the first roller tube at a rotational speed that is less than a rotational speed at which the second roller tube is rotated by the second drive system such that the lower ends of the first and second shade fabrics move together at substantially the same linear shade speed.

15. The roller shade system according to claim 14, wherein the drive system of each roller shade includes a motor having a rotatingly driven output shaft and wherein the at least one controller is adapted to direct a pulse width modulated duty cycle signal to the drive systems of the roller shades for varying the rotational speed of the motor output shafts for the drive systems.

16. The roller shade system according to claim 15, wherein each roller shade further includes an H-bridge circuit between the motor of each drive system and the at least one controller.

17. A roller shade system comprising:

first and second roller shades, each including a rotatably supported roller tube and a flexible shade fabric windingly received by the roller tube, each roller shade further including a drive system operably engaging the associated roller tube for drivingly rotating the roller tube for movement of a lower end of the associated shade fabric between a fully-opened shade position and a fully-closed shade position, each of the drive systems adapted to vary the rotational speed at which the associated roller tube is rotated,

the second shade fabric having a thickness that is greater than a thickness of the first shade fabric; and

at least one controller for directing the first and second drive systems to rotate the first and second roller tubes, the controller adapted to direct the first drive system to rotate the first roller tube at a rotational speed that is less than a rotational speed at which the second roller tube is rotated by the second drive system such that the lower ends of the first and second shade fabrics move together at substantially the same linear shade speed.

18. The roller shade system according to claim 17, wherein the drive system of each roller shade includes a motor having a rotatingly driven output shaft and wherein the at least one controller is adapted to direct a pulse width modulated duty cycle signal to the drive systems of the roller shades for varying the rotational speed of the motor output shafts for the drive systems.

19. The roller shade system according to claim 18, wherein each roller shade further includes an H-bridge circuit between the motor of each drive system and the at least one controller.

20. A method for controlling a roller shade having a rotatably supported roller tube windingly receiving a flexible shade fabric and a motor having a rotatingly driven output shaft for rotating the roller tube to move the shade fabric between a fully-opened position and a fully-closed position, the method comprising:

providing at least one Hall effect sensor adapted to generate signals representing rotation of the output shaft of the motor;

providing a microprocessor adapted to receive the signals from the at least one Hall effect sensor and to maintain a counter number that is increased or decreased depending on the direction of rotation for the motor output shaft;

associating a counter number with the fully-opened position of the shade, the counter number associated with the fully-opened position being sufficiently large to provide for a positive counter number during any shade movement regardless of whether the counter number is increased or decreased during movement of the shade fabric from the fully-opened shade position.